

Wind/Diesel Hybrid Technology for International Development: Opportunities and Constraints

Jerome Weingart

Jerome Weingart and Associates

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(NREL)

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Part 2: Market Development Considerations for the Private Sector

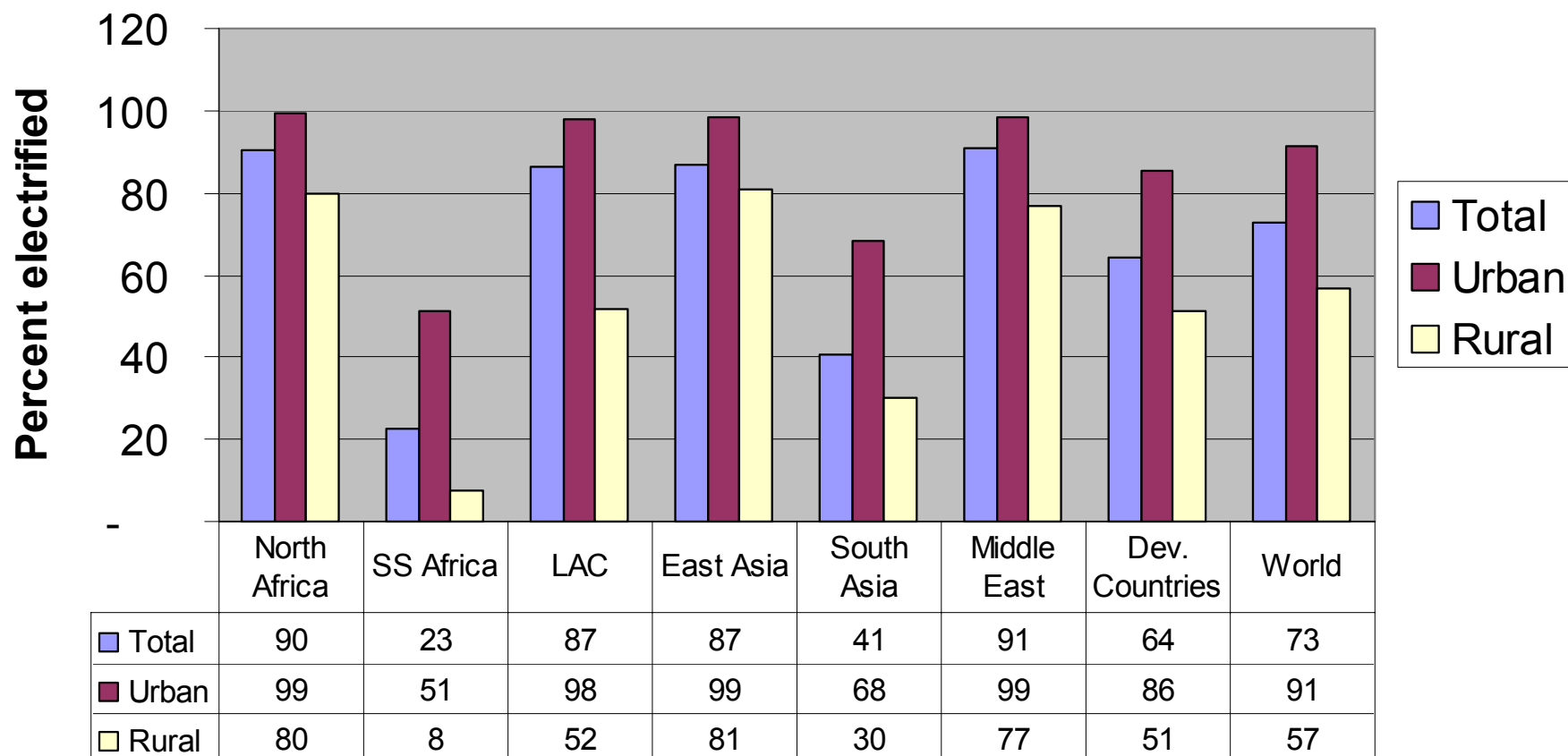
Requirements for private sector energy investments in developing countries

- Civil society and rule of law
- Clear and transparent rules for private sector participation
- Legal and regulatory framework to support private sector participation
- Modern financial / banking system
- Strong national leadership and commitment

Public/Private Partnerships for Village Power

- Needs of the Private Sector
 - Well-defined market with opportunities for market aggregation
 - In country capacity (technical, institutional, financial)
 - Enabling and attractive legal, regulatory, and policy environment (*enabling environment*)
 - Financial and political guarantees to minimize and insure against risk (political, currency, ...)

Urban and Rural Electrification (year 2000)



Source: World Bank (Jamal Saghir, 2002)

Some countries with good potential for wind-diesel hybrid power systems

- Indonesia (small island grids)
- Philippines (small island grids)
- Brazil (northeast)
- China (western regions, islands)
- Coastal sub-Saharan Africa (e.g., Mauritania, Senegal, Namibia, ..)
- Latin America (Argentina, Brazil, Chile, Peru...)

Obstacles to Large-scale Use

- Implementing agencies unfamiliar with hybrids
- Financial institutions unfamiliar with hybrids and have no experience lending for these
- Relatively higher first costs require life-cycle costing and mid-term to long-term financing for competitiveness; most off-grid applications are decided on a first-cost basis
- Lack of **in-country supportive infrastructure** for sales, installation, operation, and maintenance

Barriers to Decentralized Energy (DE) in 6 Developing Countries*

- Inadequate awareness of benefits of DE
- Regulations favor central generation
- Legislation limiting private power
- Subsidized central electricity tariffs
- Discrimination against renewables
- Financial institutions lack DE experience
- Etc.....

* Chile, India, Mexico, Peru, South Africa, Sri Lanka. Source: WADE
Jerome Weinger and Associates
(2004). *World Survey of Decentralized Energy 2004*

Observations and comments from international development community

- Organizations
 - UNDP
 - UNDESA
 - UNEP
 - World Bank
 - International Finance Corporation (IFC)

Observations and comments from international development community

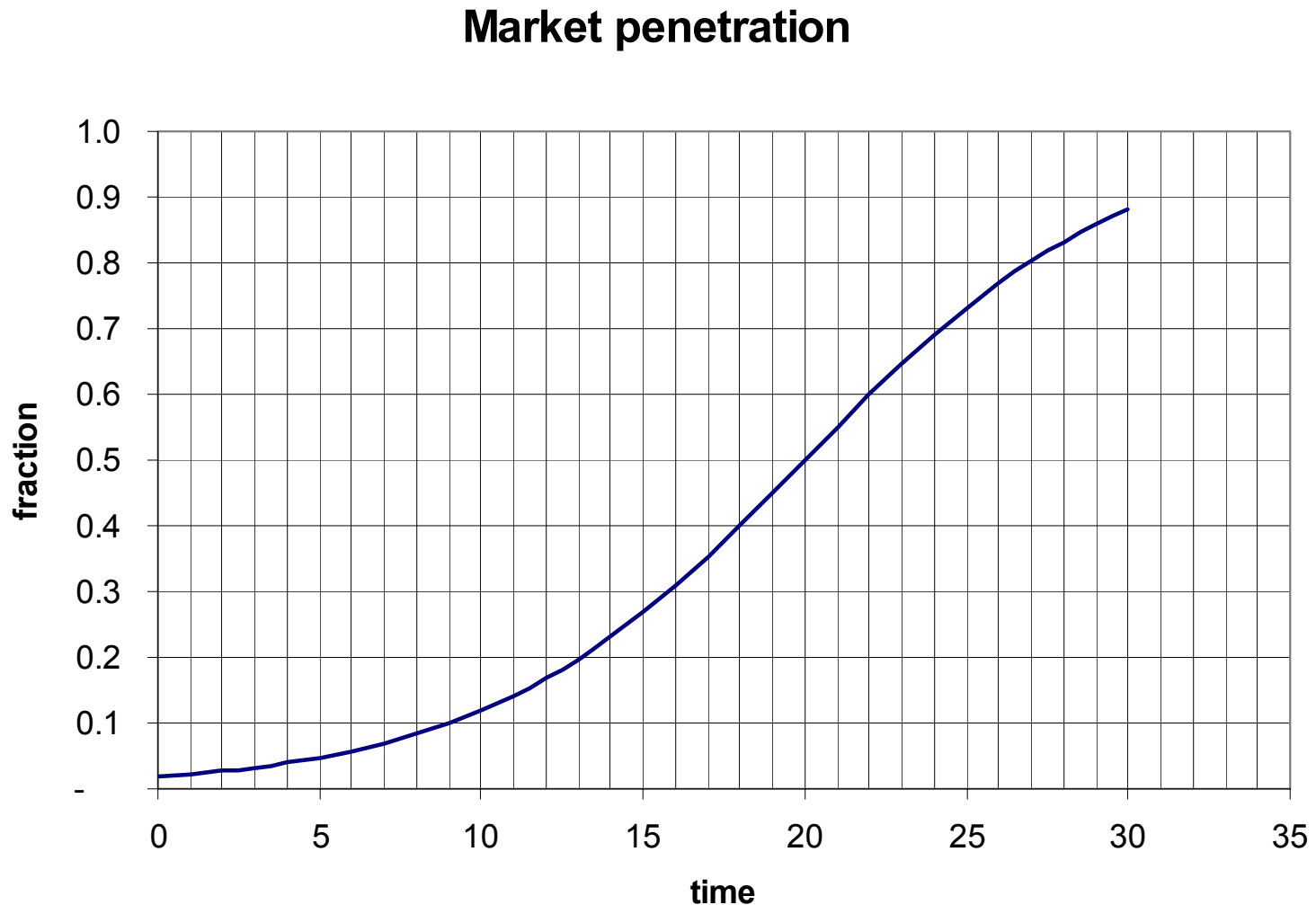
- The case for W-D hybrids has to be built on sound and well documented assessments of technical, operational, and commercialization experiences.
- Availability of credible data for these elements under conditions obtaining in developing countries continues to be a problem in assessing W-D potential.
- Needs to be greater dialogue with IFIs, including GEF. Timing is good due to Bonn conference and announcement of WB targets.

Cape Verde wind/diesel units

Reserved for photo
of fully operational
system

View from the World
Bank: *None* of the
wind turbines or
wind/diesel hybrids
was operational in
late 2003.

Long-term *programs* are needed;
short-term projects are not enough



International Finance Corporation

- Mission: to promote sustainable *private sector investment* in developing countries
- Invests on a commercial basis
- Portfolio of \$16.8 billion

IFC Renewable Energy Investments

- Over \$700 million equity and loans in renewable energy project commitments since 1990
- 21 projects in 11 countries, run-of-river hydro, geothermal, bagasse cogen, PV
- Current sustainable energy portfolio \$218 million – mainly run-of-river hydro

IFC GEF Clean Energy Projects

- 10 active energy or multi-focal projects, over \$120 million in GEF support
- Largest source of funding for off-grid solar home system enterprises
- Energy efficiency focus on financial intermediation and transforming markets
- New technology commercialization: grid-connected PV and fuel cells (*but no wind-diesel hybrids*)



***Wind farm in Costa Rica financed
by IFC, GEF and others.***

IFC Sustainable Energy Investments -- Challenges

- Limited number of quality projects with attractive returns, small # sponsors (can WBG do more?)
- Regulatory uncertainty and barriers
- Back-sliding in regulatory reform, commitment to private power, or lack of familiarity with RE
- Problems finding creditworthy off-takers
- Lack of infrastructure and higher perceived risk
- Smaller project size (for power sector)
- Conclusion: Distributed generation, non-project finance?

The IFC-GEF Renewable Energy Mission

- Meeting energy needs in developing countries in an environmentally friendly manner
 - Follow an incremental cost approach
 - Look for niche opportunities & applications
 - Be innovative with technologies, financing, and market penetration mechanisms
 - Play a pioneering & catalytic role for mainstream players to follow

Developing a Scale Up Strategy for IFC

Identify region/country w/ enabling environment & market opportunity

Approach region/country as World Bank Group joint initiative:

- WB policy and regulatory expertise
- IFC private sector experience and contacts

Develop master agreements w/ manufacturers and financiers to reduce transaction costs and facilitate local financing

- Provide IFC portfolio approach to risk management
- Push for rapid penetration through market aggregation model

Conclusions - What Works

- Successive staging of pilot projects with experience from previous projects
- Moving from pilot projects with cost-shared funding to commercial projects
- Support at all levels of government
- Capacity building of local companies by RE pilot project implementation
- Clusters of projects to ensure institutional viability
- Small number of pilot projects not financially viable

Addressing the Obstacles

- Pilot projects that replicate commercial applications and environment
- In-country training of public agencies, financial institutions, and private sector companies in hybrid applications and operations
- Incorporation of hybrids into lending practices of development banks and commercial banks
- Policy initiatives supporting private sector investment in renewable energy for off-grid and grid connected applications

What needs to be done

- International financial institutions (IFIs)
 - Develop awareness, knowledge, interest, commitment, and experience
 - Build in-house technical and project experience
 - Expand participation in projects
 - Incorporate energy, renewables, hybrids explicitly in poverty reduction plans and country assistance strategies

What needs to be done

Developing country leaders & stakeholders

- *All of the above, plus*
- Establish “enabling environment” for broad use of renewables
- Obtain and target patient finance for renewables
- Integrate clean(er) energy options with other sectors (health, education, telecom, clean water, agriculture, enterprise, etc.)
- Build the technical, financial, and policy expertise and capacity to support widespread use of renewables

Bridging the gap: wind-diesel and international development communities

- Awareness and information: web site(s), full-color brochure and application bulletins, in-country workshops (e.g., GVEP), videos
- Capacity building: Training programs and internships for DC* energy and development professionals, financial institutions, development stakeholders
- Pilot [finding the way] projects in key developing countries

* Developing Country (and also Washington, DC)

International Financial and Development Assistance Agencies

- Multilateral development banks
 - World Bank Group (WBG)
 - Asian Development Bank (ADB)
 - Inter-American Development Bank (IBRD)
 - European Development Bank (EBRD)
 - African Development Bank (AfDB)
- United Nations
 - UN Development Programme (UNDP)
 - UN Environment Programme (UNEP)
 - UN Industrial Development Organization (UNIDO)

International Financial and Development Assistance Agencies

- Bilateral development assistance (and tied aid *)
 - AUSAID (Australia)*
 - CIDA (Canada)
 - CF (France)*
 - DANIDA (Denmark)*
 - GTZ and KFW (Germany)
 - JICA (Japan)*
 - Netherlands *
 - USAID (US)
- Partners in Development
 - Global Environment Facility (GEF)
 - National laboratories (NREL, Risoe, ..)
 - Non-Governmental Organizations (NGOs)
 - International sustainable development organizations